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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/664,431	09/19/2003	Hyungsoo Choi	UNIL-23	4506
52450	7590	12/11/2006		
KRIEG DEVAULT LLP ONE INDIANA SQUARE SUITE 2800 INDIANAPOLIS, IN 46204-2079			EXAMINER STOUFFER, KELLY M	
			ART UNIT 1762	PAPER NUMBER

DATE MAILED: 12/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/664,431

Applicant(s)

CHOI, HYUNGSOO

Examiner

Kelly Stouffer

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 October 2006.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-40 is/are pending in the application.
- 4a) Of the above claim(s) 28-40 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 9/19/03 1/19/06 6/26/06.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of claims 1-27 in the reply filed on 25 October 2006 is acknowledged. The traversal is on the ground(s) that both groups of claims could be examined together without an undue burden on the examiner. This is not found persuasive because the two groups of claims correspond to both a method and product classified in separate classes which would require a separate search for each group and therefore presents an undue burden on the examiner.

The requirement is still deemed proper and is therefore made FINAL.

Claims 28-40 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 25 October 2006.

Specification

2. The disclosure is objected to because of the following informalities: catalyticly in line 1 of the abstract should be --catalytically--.

Appropriate correction is required.

3. The following guidelines illustrate the preferred layout for the specification of a utility application. These guidelines are suggested for the applicant's use.

Arrangement of the Specification

As provided in 37 CFR 1.77(b), the specification of a utility application should include the following sections in order. Each of the lettered items should appear in upper case, without underlining or bold type, as a section heading. If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

- (a) TITLE OF THE INVENTION.
- (b) CROSS-REFERENCE TO RELATED APPLICATIONS.
- (c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT.
- (d) THE NAMES OF THE PARTIES TO A JOINT RESEARCH AGREEMENT.
- (e) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC.
- (f) BACKGROUND OF THE INVENTION.
 - (1) Field of the Invention.
 - (2) Description of Related Art including information disclosed under 37 CFR 1.97 and 1.98.
- (g) BRIEF SUMMARY OF THE INVENTION.
- (h) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).
- (i) DETAILED DESCRIPTION OF THE INVENTION.
- (j) CLAIM OR CLAIMS (commencing on a separate sheet).
- (k) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).
- (l) SEQUENCE LISTING (See MPEP § 2424 and 37 CFR 1.821-1.825. A "Sequence Listing" is required on paper if the application discloses a nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if the required "Sequence Listing" is not submitted as an electronic document on compact disc).

Field of the Invention and Description of the Related Art subheadings are missing. Appropriate correction is requested.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 6 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 6 recites the limitation "said forming" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

5. Claims 1-3, 5, 6, 8-11, 13-18, 20-22 and 26-27 are rejected under 35 U.S.C. 102(a) as being anticipated by Ross et al. (App. Phys. Lett. 2003 83(6) pp1225-1227).

Regarding claim 1, Ross et al. discloses performing vapor deposition with an organometallic vapor including copper (column 1 lines 1-7) to form a number of nanostructures on a substrate (abstract), the nanostructures each being freestanding during formation (vertically-aligned as in Figure 1b and without the use of a template or patterning device as freestanding is defined by the applicant) and composed of a material including copper (abstract and title). The nanostructures have a dimension of

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less than 500 nm as shown in Figure 1a and have a second dimension extending to a respective free end of at least ten times the first dimension as shown in Figure 1b.

With regard to claim 2, the method as disclosed by Ross et al. is the same as that claimed and disclosed by the applicant to provide monocrystalline nanostructures, therefore the nanostructures formed as monocrystalline nanostructures is inherent, as this would be a result of performing the method.

Regarding claim 5, the vapor is generated by evaporating a copper-containing precursor (column 1, second paragraph).

Regarding claim 6, the substrate is heated to less than 400 °C during forming (Table 1).

Regarding claim 8, the vapor deposition is of a chemical vapor deposition type (abstract).

Regarding claim 9, the method of Ross et al. deposits monocrystalline nanowires on the surface as discussed above.

Regarding claim 10, Ross et al. describes the method as useful in circuit repair in column 1, first paragraph.

Regarding claim 11, Ross et al. discloses the nanowires as copper as discussed above.

Regarding claim 13, the substrate is heated to less than 400 °C during forming (Table 1).

Regarding claim 14, the first dimension of the nanowires is less than 50 nm in Figure 1a.

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Regarding claim 15, the method is disclosed by Ross as discussed above, and the nanowires are grown noncatalytically (entire document).

Regarding claim 16, the first dimension of the nanowires is less than 50 nm in Figure 1a.

With regard to claim 17, the method as disclosed by Ross et al. is the same as that claimed and disclosed by the applicant to provide monocrystalline nanostructures, therefore the nanostructures formed as monocrystalline nanostructures is inherent, as this would be a result of performing the method.

Regarding claim 18, Ross et al. discloses the nanowires as copper as discussed above.

Regarding claim 20, the substrate is heated to less than 400 °C during forming (Table 1).

The method of claim 21 is disclosed by Ross et al. as discussed above.

Regarding claim 22, Ross et al. describes the method as useful in circuit repair in column 1, first paragraph.

Regarding claim 26, Ross et al. discloses the nanowires as copper as discussed above.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
6. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ross et al.

With regard to claim 3, the method of Ross et al. is disclosed to make nanowires (column 1, first paragraph) and the second dimension can be made as long as desired (Figure 1b, Figure 2a, and growth rates in Table 1). It would have been obvious to one of ordinary skill in the art to grow nanowires with a second dimension at least 50 times greater than the first dimension depending on the desired functionality of the nanowires.

7. Claims 4, 12, 19, and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ross et al. in view of Choi (WO 00/08225).

Ross et al. includes the provisions of claims 4, 12, 19, and 23 except for using Cu(ethylacetoacetate)L₂ with L being trialkyl phosphite and the precursor compounds of claim 23. Choi teaches using a Cu(ethylacetoacetate)L₂ with L being trialkyl phosphite compound and the precursor compounds of claim 23 because these precursors have a

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high thermal stability, volatility, and ability to deposit high quality copper using CVD techniques (abstract).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Ross et al. to include $\text{Cu}(\text{ethylacetoacetate})\text{L}_2$ with L being trialkyl phosphite as the copper nanowire precursor and the precursor compounds of claim 23 as taught by Choi in order to use precursors with a high thermal stability, volatility, and ability to deposit high quality copper using CVD techniques.

Regarding claim 24, Ross et al. discloses the chamber pressure to be less than 1 torr in column 1, paragraph 2.

Regarding claim 25, the precursor of Ross et al. is decomposed to release copper in columns 4-5.

8. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ross et al. in view of US Patent number 5980983 to Gordon.

Ross et al. includes the provisions of claim 7 except providing oxygen with the copper precursor. Gordon teaches providing oxygen with the copper precursor to make copper oxide in examples 1 and 30.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Ross et al. to include oxygen with the copper precursor as taught by Gordon in order to make copper oxide nanostructures.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kelly Stouffer whose telephone number is (571) 272-2668. The examiner can normally be reached on Monday - Thursday 7:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kelly Stouffer
Examiner
Art Unit 1762

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TIMOTHY MEKS
SUPERVISORY PATENT EXAMINER